

IN THE CLAIMS:

No claims have been amended herein. Please note that all claims currently pending and under consideration in the referenced application are shown below. This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1-9 (Canceled)

10. (Previously presented) A method for forming a semiconductor device structure comprising:

providing a semiconductor substrate assembly having a surface;
forming a layer of ruthenium relative to a silicon-containing region; and
performing an anneal in an oxidizing atmosphere to form RuSi_xO_y from the layer of ruthenium and the silicon-containing region.

11. (Original) The method of claim 10, wherein forming the layer of ruthenium includes depositing the layer of ruthenium by chemical vapor deposition.

12. (Original) The method of claim 10, wherein forming the layer of ruthenium includes depositing the layer of ruthenium by atomic layer deposition.

13. (Original) The method of claim 12, wherein forming the layer of ruthenium includes depositing three to five monolayers of RuSi_xO_y .

14. (Previously presented) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere includes performing an anneal in an atmosphere including an oxidizing gas.

15. (Previously presented) The method of claim 10, further including forming at least one additional conductive material over the diffusion barrier layer and selecting the at least one additional conductive material from a group of a metal and a conductive metal oxide.

16. (Previously presented) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere to form the RuSi_xO_y includes performing an anneal at a temperature in a range of about 400°C to about 1000°C .

17. (Previously presented) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere to form RuSi_xO_y from the layer of ruthenium and the silicon-containing region comprises performing said anneal in an atmosphere comprising air, oxygen, and oxygen-containing compounds.

18. (Previously presented) The method of claim 10, wherein said silicon-containing region includes at least a portion of said semiconductor substrate assembly.

19. (Previously presented) The method of claim 10, wherein said RuSi_xO_y is deposited in an oxidizing atmosphere.

20. (Previously presented) The method of claim 10, wherein said RuSi_xO_y is deposited in an atmosphere including an oxidizing gas.

21-58 (Canceled)

59. (Previously presented) A method for forming a semiconductor device structure having a RuSi_xO_y barrier layer, the method comprising:

(a) placing a semiconductor substrate assembly in a reaction chamber, said semiconductor

- substrate assembly having a surface;
- (b) introducing a ruthenium precursor into said reaction chamber to form a single layer of ruthenium on at least a portion of said semiconductor substrate assembly surface;
 - (c) introducing a nonreactive gas into said reaction chamber to substantially cover said single layer of ruthenium and purge said ruthenium precursor from said reaction chamber;
 - (d) introducing a silicon precursor into said reaction chamber to form a single layer of RuSi_xO_y on at least a portion of said semiconductor substrate assembly surface; and
 - (e) introducing a nonreactive gas into said reaction chamber to substantially cover said single layer of RuSi_xO_y and purge said silicon precursor from said reaction chamber.

60. (Previously presented) The method of claim 59, further comprising introducing an oxygen-containing substance into said reaction chamber to form a single barrier layer of RuSi_xO_y on the at least a portion of said semiconductor substrate assembly surface.

61. (Previously presented) The method of claim 59, wherein said introducing said silicon precursor into said reaction chamber comprises introducing said silicon precursor in an oxidizing atmosphere within said reaction chamber.

62. (Previously presented) The method of claim 61, wherein said introducing said silicon precursor in an oxidizing atmosphere comprises introducing said silicon precursor in an atmosphere comprising air, oxygen, or an oxygen-containing compound.

63. (Original) The method of claim 59, wherein said ruthenium precursor comprises $\text{C}_6\text{H}_8\text{Ru}(\text{CO})_3$.

64. (Previously presented) The method of claim 59, wherein said introducing said nonreactive gas comprises introducing a nonreactive gas selected from a group consisting of nitrogen, argon, neon, and xenon.

65. (Previously presented) The method of claim 59, wherein said introducing said silicon precursor comprises introducing silane or disilane into said reaction chamber.

66. (Original) The method of claim 59, wherein steps (a) through (e) are repeated to form 3 to 5 RuSi_xO_y barrier monolayers.